CLAIMS

What is claimed is:

1. A method for selecting a projection data set, comprising:

(a) acquiring a set of projection data;

(b) calculating at least one set of the 0th order moments, the 1st order moments, and the 2nd order moments of the set of projection data at different views positions for an axial location;

(c) selecting a reference projection data set from the projection data at the axial location;

(d) generating two or more comparison projection data sets from the projection data at the axial location;

(e) deriving a correlation error for each comparison projection data set relative to the reference projection data set using the at least one set of moments; and

(f) selecting a matching projection data set based upon the correlation errors.

2. The method as recited in claim 1, wherein the set of projection data is acquired with a multi-slice CT detector system.

3. The method as recited in claim 1, wherein the set of projection data is acquired with a volumetric CT detector system.

4. The method as recited in claim 1, wherein the set of projection data comprises a set of cardiac projection data.

5. The method as recited in claim 1, wherein calculating the moments is performed at all view positions.

6. The method as recited in claim 1, wherein the reference projection data set comprises a half-scan projection data set.

7. The method as recited in claim 1, wherein the comparison projection data sets comprise multi-sector projection data sets.

8. The method as recited in claim 7, wherein up to N x O multi-sector projection data sets are generated.

9. The method as recited in claim 1, wherein the correlation error is derived by summing the absolute values of the differences between the moments of the reference projection data set and the respective moments of the comparison projection data set at comparable view positions.

10. The method as recited in claim 1, wherein the matching projection data set is selected which has the lowest correlation error.

11. The method as recited in claim 1, further comprising reconstructing an image from the matching projection data set.

12. The method as recited in claim 1, further comprising extracting periodicity information from the matching projection data sets or from an image reconstructed from the matching projection data sets.

13. The method as recited in claim 12, further comprising reconstructing one or more images from the set of projection data using the periodicity information.

14. The method as recited in claim 1, further comprising repeating steps (b) through (f) for additional axial locations.

15. The method as recited in claim 14, further comprising reconstructing an image for each matching projection data set.

16. The method as recited in claim 15, further comprising rendering a volume comprising the images.

17. The method as recited in claim 14, further comprising extracting periodicity information from the matching projection data sets or from images reconstructed from the matching projection data sets.

18. The method as recited in claim 17, further comprising reconstructing one or more images from the set of projection data using the periodicity information.

19. A computer program, provided on one or more computer readable media, for selecting a projection data set, comprising:

a routine for acquiring a set of projection data;

a routine for calculating at least one set of the 0th order moments, the 1st order moments, and the 2nd order moments of the set of projection data at different views positions for an axial location;

a routine for selecting a reference projection data set from the projection data at the axial location;

a routine for generating two or more comparison projection data sets from the projection data at the axial location;

a routine for deriving a correlation error for each comparison projection data set relative to the reference projection data set using the at least one set of moments; and

a routine for selecting a matching projection data set based upon the correlation errors.

20. The computer program as recited in claim 19, wherein the set of projection data comprises a set of cardiac projection data.

21. The computer program as recited in claim19, wherein the routine for calculating the moments calculates the moments at all view positions.

22. The computer program as recited in claim19, wherein the reference projection data set comprises a half-scan projection data set.

23. The computer program as recited in claim19, wherein the comparison projection data sets comprise multi-sector projection data sets.

24. The computer program as recited in claim 23, wherein the routine generates up to N x O multi-sector projection data sets.

25. The computer program as recited in claim19, wherein the routine for deriving a correlation error sums the absolute values of the differences between the moments of the reference projection data set and the respective moments of the comparison projection data set at comparable view positions.

26. The computer program as recited in claim19, wherein the routine for selecting a matching projection data set selects the matching projection data set which has the lowest correlation error.

27. The computer program as recited in claim 26, further comprising a routine for reconstructing an image from the matching projection data set.

28. The computer program as recited in claim19, further comprising a routine for extracting periodicity information from the matching projection data sets or from an image reconstructed from the matching projection data sets.

29. The computer program as recited in claim 28, further comprising a routine for reconstructing one or more images from the set of projection data using the periodicity information.

30. The computer program as recited in claim 29, further comprising a routine for rendering a volume from two or more reconstructed images.

31. A CT image analysis system comprising:

an X-ray source configured to emit a stream of radiation;

a detector configured to detect the stream of radiation and to generate one or more signals responsive to the stream of radiation, wherein the detector comprises a plurality of detector elements;

a system controller configured to control the X-ray source and to acquire a set of projection data from one or more of the detector elements via a data acquisition system; and

a computer system configured to receive the set of projection data, to calculate at least one set of the 0th order moments, the 1st order moments, and the 2nd order moments of the set of projection data at different views positions for an axial location, to select a reference projection data set from the projection data at the axial location, to generate two or more comparison projection data sets from the projection data at the axial location, to derive a correlation error for each comparison projection data set relative to the reference projection data set using the at least one set of moments, and to select a matching projection data set based upon the correlation errors.

32. The CT image analysis system as recited in claim 31, wherein the detector comprises a multi-slice CT detector.

33. The CT image analysis system as recited in claim 31, wherein the detector comprises a volumetric CT detector.

34. The CT image analysis system as recited in claim 31, wherein the set of projection data comprises a set of cardiac projection data.

35. The CT image analysis system as recited in claim 31, wherein the computer calculates the moments at all view positions.

36. The CT image analysis system as recited in claim 31, wherein the comparison projection data sets comprise multi-sector projection data sets, and wherein the computer is configured to generate up to N x O multi-sector projection data sets.

37. The CT image analysis system as recited in claim 31, wherein the computer derives the correlation error by summing the absolute values of the differences between the moments of the reference projection data set and the respective moments of the comparison projection data set at comparable view positions.

38. The CT image analysis system as recited in claim 31, wherein the computer selects the matching projection data set which has the lowest correlation error.

39. The CT image analysis system as recited in claim 31, wherein the computer is further configured to reconstruct an image from the matching projection data set.

40. The CT image analysis system as recited in claim 31, wherein the computer is further configured to extract periodicity information from the matching projection data sets or from an image reconstructed from the matching projection data sets.

41. The CT image analysis system as recited in claim 40, wherein the computer is further configured to reconstruct one or more images from the set of projection data using the periodicity information.

42. The CT image analysis system as recited in claim 41, wherein the computer is further configured to render a volume from two or more reconstructed images.

43. A CT image analysis system comprising:

an X-ray source configured to emit a stream of radiation;

a detector configured to detect the stream of radiation and to generate one or more signals responsive to the stream of radiation, wherein the detector comprises a plurality of detector elements;

a system controller configured to control the X-ray source and to acquire a set of projection data from one or more of the detector elements via a data acquisition system;

a computer system configured to receive the set of projection data;

means for calculating at least one set of moments of the set of projection data at different views positions for an axial location;

means for selecting a reference projection data set from the projection data at the axial location;

means for generating two or more comparison projection data sets from the projection data at the axial location;

means for deriving a correlation error for each comparison projection data set relative to the reference projection data set using the at least one set of moments; and

means for selecting a matching projection data set based upon the correlation errors.

44. The CT image analysis system as recited in claim 43, further comprising means for reconstructing an image from the matching projection data set.

45. The CT image analysis system as recited in claim 43, further comprising means for reconstructing one or more images from the set of projection data using periodicity information extracted from the matching projection data sets or from an image reconstructed from the matching projection data sets.

46. A method for generating a motion signal from a set of projections, comprising:

acquiring a set of projection data, wherein the set of projection data is acquired by a slowly rotating area detector and cone-beam radiation source;

calculating the 0th order moments for the set of projection data for each view position to form an aggregate motion signal; and

separating the aggregate motion signal into a corruptive signal and a desired motion signal based on frequency characteristics.

47. The method as recited in claim 46, wherein a rotation of the area detector and cone-beam radiation source takes more than 3 seconds.

48. The method as recited in claim 47, wherein the rotation takes 18 seconds or more.

49. The method as recited in claim 46, wherein separating the aggregate signal occurs in the temporal domain.

50. The method as recited in claim 46, wherein separating the aggregate signal occurs in the Fourier transform domain after performing a Fourier transformation of the 0th order moments.

51. The method as recited in claim 46, wherein the desired motion signal is a cardiac motion signal.

52. The method as recited in claim 51, further comprising reconstructing one or more images based upon the desired motion signal.

53. The method as recited in claim 46, wherein the set of projection data is a subset of the total projection data.

54. The method as recited in claim 53, wherein the set of projection data comprises those projections associated with a volume of interest in the field of view.

55. The method as recited in claim 54, wherein the volume of interest comprises a volume associated with an internal organ.

56. The method as recited in claim 55, wherein the internal organ is a heart.

57. A computer program, provided on one or more computer readable media, for generating a motion signal from a set of projections, comprising:

a routine for acquiring a set of projection data using a slowly rotating area detector and cone-beam radiation source;

a routine for calculating the 0th order moments for the set of projection data for each view position to form an aggregate motion signal; and

a routine for separating the aggregate motion signal into a corruptive signal and a desired motion signal based on frequency characteristics.

58. The computer program as recited in claim 57, wherein the routine for separating the aggregate motion signal separates the aggregate motion signal in the temporal domain.

59. The computer program as recited in claim 57, wherein the routine for separating the aggregate motion signal separates the aggregate motion signal in the Fourier transform domain after performing a Fourier transformation of the 0th order moments.

60. The computer program as recited in claim 57, further comprising a routine for reconstructing one or more images based upon the desired motion signal.

61. A CT image analysis system, comprising:

a cone-beam X-ray source configured to emit a stream of radiation;

an area detector configured to detect the stream of radiation and to generate one or more signals responsive to the stream of radiation, wherein the detector comprises a plurality of detector elements;

a system controller configured to slowly rotate the cone-beam X-ray source and the area detector and to acquire a set of projection data from one or more of the detector elements via a data acquisition system; and

a computer system configured to receive the set of projection data, to calculate the 0th order moments for the set of projection data for each view position to form an aggregate motion signal and to separate the aggregate motion signal into a corruptive signal and a desired motion signal based on frequency characteristics.

62. The CT image analysis system as recited in claim 61, wherein a rotation of the area detector and cone-beam radiation source takes more than 3 seconds.

63. The CT image analysis system as recited in claim 62, wherein a rotation of the area detector and cone-beam radiation source takes 18 seconds or more.

64. The CT image analysis system as recited in claim 61, wherein the computer system is configured to separate the aggregate motion signal in the temporal domain.

65. The CT image analysis system as recited in claim 61, wherein the computer system is configured to separate the aggregate motion signal in the Fourier transform domain after performing a Fourier transformation of the 0th order moments.

66. The CT image analysis system as recited in claim 61, wherein the computer system is further configured to reconstructing one or more images based upon the desired motion signal.

67. A CT image analysis system, comprising:

a cone-beam X-ray source configured to emit a stream of radiation;

an area detector configured to detect the stream of radiation and to generate one or more signals responsive to the stream of radiation, wherein the detector comprises a plurality of detector elements;

a system controller configured to slowly rotate the cone-beam X-ray source and the area detector and to acquire a set of projection data from one or more of the detector elements via a data acquisition system;

a computer system configured to receive the set of projection data;

means for forming an aggregate motion signal; and

means for separating the aggregate motion signal into a corruptive signal and a desired motion signal based on frequency characteristics.

68. The CT image analysis system as recited in claim 67, further comprising means for reconstructing one or more images based upon the desired motion signal.